

DETAILS OF THE WEATHER IN THE UNITED STATES

GENERAL CONDITIONS

ALFRED J. HENRY

Several outstanding features may be mentioned: First, the absence of pronounced and widespread cold waves; second, the heavy rains in east Gulf and South-eastern States and the resulting floods, and, finally, the continued dry weather west of the Rocky Mountains and in California. The usual details follow.

CYCLONES AND ANTICYCLONES

By W. P. DAY

The month of January was one of considerable activity, if such a condition can be measured by the number of cyclones and anticyclones charted. During this period 22 low-pressure areas and 16 high-pressure areas were observed, with others of minor importance. Beginning with the first day a stream of Lows (5) passed through the southern Alaska region and along the northern border until the 8th, when the chain was broken by the intrusion of a HIGH from the Mackenzie Basin. Following this HIGH and its attendants from the same region, the path of the LOWS was shifted southward as far as the coast of Washington on the 13th. This stream was cut off by rising pressure on the Pacific coast. Then followed three more LOWS on the northern path, a period ending on the 21st, when high pressure, which had been developing over Alaska and the Canadian Northwest, spread southeastward into the United States. A larger installment of this cold air followed on the 25th and a third of somewhat lesser importance on the 31st. The warm currents of the LOWS broke through at the weak points north and south of these HIGHS.

FREE-AIR SUMMARY

By V. E. JAKL

It is apparent from Table 1 that the only appreciable free-air temperature departures at the aerological stations were recorded at and near the ground; elsewhere within the vertical extent of observations the average temperatures were about normal. The range of temperature with altitude showed the characteristics of continental regions in midwinter, i. e., a reversal or an absence of the usual lapse rate for a considerable height above the ground. Specifically, for the stations of record, this exception to the usual lapse rate is evidenced as a pronounced inversion in the first 1,000 meters above the ground at the northern stations, and an approximately isothermal state for the same depth of air column over the southern stations. Inasmuch as the averages and normals for the month are a composite of daily observations, many of which exhibit the usual fall in temperature with altitude, it is evident that a number of cases were recorded where the reversal of the altitude-temperature gradient occurred to a much more pronounced degree and to greater elevations than is shown by the averages. This was frequently the case during the month at the northern stations. Such inversions are sometimes caused by a wedgelike advance of a cold wave, as was shown in the free-air summary for December, 1924. In other cases they are the sequel to cold

waves, being caused by a change to warmer that is more rapid aloft than below. The following examples taken from the records of Drexel and Ellendale illustrate the free-air march in temperature and wind direction in the declining phase of cold waves. The Ellendale record covers the period from the 14th to 17th, near the end of which a rather tenacious HIGH over the region of the Dakotas gave way to a vigorous Low from Alberta. The Drexel record for the 26th-27th shows the conditions respectively in the front and rear of a fast-moving cold HIGH that swept over the station in about a day and was followed by a trough of low pressure.

Free-air conditions at Ellendale, N. Dak., January 14-17, 1925

Altitude, m. s. l.	14th		15th		16th		17th	
	Tem- pera- ture	Wind direc- tion	Tem- pera- ture	Wind direc- tion	Tem- pera- ture	Wind direc- tion	Tem- pera- ture	Wind direc- tion
<i>Meters</i>	<i>° C</i>		<i>° C</i>		<i>° C</i>		<i>° C</i>	
444 (surface).....	-25.5	WNW.	-23.4	NE.	-18.5	SSW.	-19.0	SW.
500.....	-25.0	WNW.	-24.1	NE.	-19.5	SSW.	-18.5	WSW.
1,000.....	-20.1	NW.	-20.4	ENE.	-6.7	SW.	-5.0	NW.
1,500.....	-15.0	NW.	-14.9	E.	-7.9	SW.	-4.5	NW.
2,000.....	-18.0	WNW.					-8.0	NW.
3,000.....	-19.9	NW.					-15.2	WNW.
3,400.....	-21.3	NW.					-19.0	WNW.
4,000.....	-22.0	NW.						

Free-air conditions at Drexel, Nebr., January 26-27, 1925

Altitude, m. s. l.	26th		27th	
	Tem- pera- ture	Wind direction	Tem- pera- ture	Wind direction
<i>Meters</i>	<i>° C</i>		<i>° C</i>	
396 (surface).....	-21.1	N.	-21.3	ESE.
750.....	-24.6	NNE.	-15.1	S.
1,000.....	-20.9	NNE.	-13.6	S.
2,000.....	-14.1	NE.	-8.6	SSW.
2,500.....	-12.9	NE.	-9.6	SSW.
3,000.....	-15.0	NNE.	-11.0	SW.
4,000.....			-16.4	WSW.
5,700.....			-27.7	W.

The importance of snow covering as a factor in retarding the recovery of temperature on the ground after a cold period, with particular reference to the records of Ellendale on the 14th-17th, is discussed by the official in charge of that station in the following extract from his report:

The effect a moderate snow covering on the ground has on the surface temperature is strongly manifested in the kite records of the evening of the 16th and the morning of the 17th. In each case a marked temperature inversion was present. While the flight of the 16th was comparatively low, the height of the inversion was reached at about 700 meters above ground. The flight of the 17th was much higher, and the height of the inversion was about 800 meters above ground. The lowest temperature recorded aloft in this flight was 3° C. higher than the minimum surface temperature for the day. By the end of the flight the top of the inversion had lowered to within 300 meters of the ground. These inversions are not uncommon during the winter months, but this particular record seems to show that a snow covering will retard if not wholly prevent the warming up of ground temperatures when other conditions are ripe for rising temperature. Usually when marked inversions are shown in morning flights and there is little or no snow on the ground the maximum surface temperature for that day equals or exceeds the maximum of the inversion, but in this case the surface maximum did not come within 2° C. of it.

Kite and pilot-balloon observations showed the vertical distribution of winds normal for the month, viz,